

KOTHARI INTERNATIONAL SCHOOL, NOIDA**ANNUAL EXAMINATION, SESSION: 2025-26****GRADE: 11 SUBJECT: CHEMISTRY (043)****MARKING SCHEME****SET B****SECTION – A**

The following questions are multiple -choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

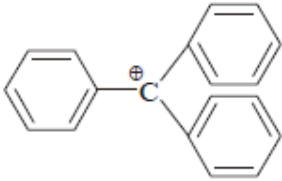
Q1.	The number of moles of solute present in 1 kg of a solvent is called. (A) Molarity (M) (B) ppm (C) Normality(N) (D) Molality (m) Ans:(D) Molality (m)	(1)
Q2.	Photoelectric effect established that light (A) behaves like particles (B) behaves like magnetic fields (C) behaves like waves (D) behaves like rays Ans: (A) behaves like particles	(1)
Q3.	30 % aqueous solution of glucose (Molar mass 180 g/mL) by mass. The mole fraction of glucose is equal to (A) 0.06 (B) 0.041 (C) 0.02 (D) 0.08 Ans: (B) 0.041	(1)
Q4.	Lines in the hydrogen spectrum which appear in the infrared region of the electromagnetic Spectrum, are called as: (A) Balmer series (B) Hydrogen line series (C) Hydrogen series (D) Paschen series Ans: (D) Paschen series	(1)
Q5.	The Ionic radius of cation is always——— (A) Less than the atomic radius (B) more than the atomic radius	(1)

	(C) Equal to atomic radius (D) Cannot be predicted Ans: (A) Less than the atomic radius	
Q6.	The element with atomic number 26 will be found in group : (A) 2 (B) 8 (C) 6 (D) 10 Ans: (B) 8	(1)
Q7.	Identify correct statement regarding NH ₃ and BF ₃ (A) Both are Lewis acid (B) Both are iso structural (C) Both are Lewis base (D) Have different values of dipole moment Ans: (D) Have different values of dipole moment	(1)
Q8.	Which of the following oxide is most acidic? (A) Na ₂ O (B) Al ₂ O ₃ (C) P ₂ O ₅ (D) SO ₃ Ans: (D) SO₃	(1)
Q9.	If the bond energies of H—H, Br—Br and H—Br are 433, 192 and 364 kJ mol ⁻¹ , respectively, then ΔH° for the reaction. H ₂ (g) + Br(g) → 2HBr (g) is (A) -261 kJ (B) -103 kJ (C) +261 kJ (D) -1031 kJ Ans : (b) -103 kJ. ΔH = B_{H-H} + B_{Br-Br} - 2B_{H-Br} = 433 + 192 - 2 × 364 = 625 - 728 = -103 kJ	(1)
Q10.	Maximum bond angle is present in case of (A) BBr ₃ (B) BCl ₃ (C) BF ₃	(1)

	(D) Same in all Ans: (d) Same in all	
Q11.	The acid –base pair that differs by oneis called a conjugate acid –base pair (A) electron (B) proton (C) hydronium ion (D) hydroxyl ion Ans: (B) proton	(1)
Q12.	The correct thermodynamic conditions for the spontaneous reaction at all temperature is: (A) $\Delta H < 0$ and $\Delta S > 0$ (B) $\Delta H < 0$ and $\Delta S < 0$ (C) $\Delta H < 0$ and $\Delta S = 0$ (D) $\Delta H > 0$ and $\Delta S < 0$ Ans: (A) $\Delta H < 0$ and $\Delta S > 0$	(1)
	<i>For Questions number 13 to 16, two statements are given---- one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.</i> (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A). (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is <i>not</i> the correct explanation of the Assertion (A). (C) Assertion (A) is true, but Reason (R) is false. (D) Assertion (A) is false, but Reason (R) is true.	
Q13.	Assertion: Chain isomerism is observed in compounds containing four or more than four carbon atoms. Reason: Only alkanes show chain isomerism. Ans. (C) Assertion (A) is true, but Reason (R) is false.	(1)
Q14.	Assertion: Lithium is a strong reducing agent. Reason: Lithium has lowest value of the standard reduction potential. Ans: (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).	(1)
Q15.	Assertion: The vapour pressure of pure liquid has a fixed value at a particular temperature. Reason: When equilibrium is reached, no more vapour are formed. Ans: (C) Assertion (A) is true, but Reason (R) is false.	(1)

<p>Q16.</p>	<p>Assertion : Benzene on heating with conc. H₂SO₄ and Conc HNO₃ gives nitro benzene. Reason : .Mixture of Conc H₂SO₄ and Conc HNO₃ produces electrophile SO₃. Ans: (C) Assertion (A) is true, but Reason (R) is false.</p>	<p>(1)</p>
<p>SECTION – B <i>This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.</i></p>		
<p>Q17.</p>	<p><i>Attempt either option a or b.</i></p> <p>a. For the equilibrium, $2\text{NOCl(g)} \rightarrow 2\text{NO(g)} + \text{Cl}_2\text{(g)}$ the value of the equilibrium constant, <i>K_c</i> is 3.75×10^{-6} at 1069 K. Calculate the <i>K_p</i> for the reaction at this temperature?(Given: <i>R</i> = 0.0831Lbar/K/mol)</p> <p style="text-align: center;">OR</p> <p>b. How can you predict the following stages of a reaction by comparing the value of <i>K_c</i> and <i>Q_c</i> ? (i) Net reaction proceeds in the forward direction. (ii) No net reaction occurs.</p> <p>Ans:</p> <p>a. We know that, $K_p = K_c(RT)^{\Delta n}$ For the above reaction, $\Delta n = (2+1) - 2 = 1$ $K_p = 3.75 \times 10^{-6} (0.0831 \times 1069)$ $K_p = 0.033$</p> <p style="text-align: center;">OR</p> <p>b. (i) <i>Q_c</i> is less than <i>K_c</i> (ii) <i>Q_c</i> is equal to <i>K_c</i></p>	<p>(2)</p>
<p>Q18.</p>	<p>A molecule of PCl₅ exists while that of NCl₅ does not. Explain. Ans:</p>	<p>(2)</p>

	<p>Ans-The valence shell electronic configurations of both N and P are as follows :</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> $[\text{He}] \begin{array}{ c } \hline 2s \\ \hline \uparrow\downarrow \\ \hline \end{array} \begin{array}{ c c c } \hline 2p \\ \hline \uparrow \uparrow \uparrow \\ \hline \end{array}$ (Nitrogen) </div> <div style="text-align: center;"> $[\text{Ne}] \begin{array}{ c } \hline 3s \\ \hline \uparrow\downarrow \\ \hline \end{array} \begin{array}{ c c c } \hline 3p \\ \hline \uparrow \uparrow \uparrow \\ \hline \end{array} \begin{array}{ c c c c } \hline 3d \\ \hline \square \square \square \square \\ \hline \end{array}$ (Phosphorus) </div> </div> <p style="text-align: right;">Since</p> <p>nitrogen atom has no vacant 2d orbitals, it cannot extend its covalency to five. Therefore, a molecule of NCl_5 does not exist. But in case of phosphorus, an electron can be promoted from 3s filled orbital to 3d vacant orbitals. Therefore, phosphorus can extend its covalency to five. Thus, a molecule of PCl_5 can exist.</p>	
<p>Q19.</p>	<p>Calculate the molarity of NaOH in the solution prepared by dissolving its 4 g in enough water to form 250 mL of the solution.</p> <p>Ans: $M = 3 \text{ mol L}^{-1}$ Mass of NaCl in 1 L solution = $3 \times 58.5 = 175.5 \text{ g}$ Mass of 1L solution = $1000 \times 1.25 = 1250 \text{ g}$ (since density = 1.25 g mL^{-1}) Mass of water in solution = $1250 - 175.5 = 1074.5 \text{ g}$ Molality = No. of moles of solute/Mass of solvent in kg = $3 \text{ mol}/1.0745 \text{ kg} = 2.79 \text{ m}$</p>	<p>(2)</p>
<p>Q20.</p>	<p>Calculate the bond enthalpy of Cl—Cl bond from the following data:</p> <p style="text-align: center;">$\text{CH}_4(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow \text{CH}_3\text{Cl}(\text{l}) + \text{HCl}(\text{l}) \quad [\Delta H = -100.3 \text{ kJ mol}^{-1}]$</p> <p>Given: bond enthalpies of C—H, C—Cl and H—Cl bonds are 413, 326 and 431 kJ mol^{-1} respectively.</p> <p>Ans :</p> <div style="text-align: center;"> $\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{H}(\text{g}) \\ \\ \text{H} \end{array} + \text{Cl}-\text{Cl}(\text{g}) \longrightarrow \begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{Cl}(\text{g}) \\ \\ \text{H} \end{array} + \text{H}-\text{Cl}(\text{g})$ </div> <p style="text-align: center;">$\Delta H = -100.3 \text{ kJ mol}^{-1}$</p> <p>Enthalpy of reaction = Bond energy of reactants - Bond energy of products</p> <p>$\Delta H = [4 \times \text{B.E.}(\text{C}-\text{H}) + \text{B.E.}(\text{Cl}-\text{Cl})] - [3 \times \text{B.E.}(\text{C}-\text{H}) + \text{B.E.}(\text{C}-\text{Cl}) + \text{B.E.}(\text{H}-\text{Cl})]$</p> <p>$\Delta H = \text{B.E.}(\text{C}-\text{H}) + \text{B.E.}(\text{Cl}-\text{Cl}) - \text{B.E.}(\text{C}-\text{Cl}) - \text{B.E.}(\text{H}-\text{Cl})$</p> <p>$-100.3 = 413 + \text{B.E.}(\text{Cl}-\text{Cl}) - 326 - 431$</p> <p>or, $\text{B.E.}(\text{Cl}-\text{Cl}) = -100.3 + 326 + 431 - 413$</p> <p>or, $\text{B.E.}(\text{Cl}-\text{Cl}) = 243.7 \text{ kJ mol}^{-1}$</p>	<p>(2)</p>
<p>Q21.</p>	<p>(a) Which distillation method is used to separate a mixture of o-nitrophenol and p-nitrophenol?</p> <p>(b) Name the type of isomerism exhibited by acetone and propanal.</p> <p>Ans. (a) Steam Distillation (b) Funtional Isomerim</p>	<p>(2)</p>
<p>SECTION – C</p> <p><i>This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.</i></p>		
<p>Q22.</p>	<p>Describe the effect of :</p>	<p>(3)</p>

	<p>(a) addition of H₂ (b) addition of CH₃OH (c) removal of CO on the equilibrium of the reaction: $2\text{H}_2(\text{g}) + \text{CO}(\text{g}) \rightarrow \text{CH}_3\text{OH}(\text{g})$</p> <p>Ans: (a) addition of H₂ the equilibrium will shift to RHS (b) addition of CH₃OH the equilibrium will shift to LHS (c) removal of CO the equilibrium will shift to LHS</p>	
<p>Q23.</p>	<p>(a) The structure of triphenylmethyl cation is given below. This is very stable and some of its salts can be stored for months. Explain the cause of high stability of this cation.</p> <div style="text-align: center;">  </div> <p>(b) Why tertiary carbanions are not stable? Explain.</p> <p>Ans: (a) This carbocation is attached with 3 benzene rings which stabilise the positive charge by involving it in their 15 resonating structures. (b) Greater the number of alkyl groups attached to a negatively charged carbon atom, the greater is the +I effect of methyl group then carbanion will be less stable because carbanion is already an electron rich species it doesn't need electrons.</p>	<p>(3)</p>
<p>Q24.</p>	<p>Attempt either option a or b.</p> <p>a. A compound on analysis was found to contain C = 34.6%, H = 3.85% and O = 61.55%. Calculate the empirical formula.</p> <p style="text-align: center;">OR</p> <p>b. (i) What is the limiting reagent? (ii) Oxygen is prepared by catalytic decomposition of potassium chlorate (KClO₃). Decomposition of potassium chlorate gives potassium chloride (KCl) and oxygen (O₂). If 2.4 mol of oxygen is needed for an experiment, how many grams of potassium chlorate must be decomposed? (At. mass of K = 39, Cl = 35.5, O = 16)</p> <p>Ans: (Hints: Step 1 Calculating relative no. in moles for each atom e.g., C = 34.6/12 = 2.88 H = 3.85 / 1 = 3.85 O = 61.55 / 16 = 3.85 Step-2 Relative whole No. of atoms C:H:O = 2.88:3.85:3.85 = 1:1.33:1.33 = 3:4:4 Hence Empirical formula of the compound C₃H₄O₄</p> <p style="text-align: center;">OR</p>	<p>(3)</p>

	<p>(i) It is the reagent which is entirely consumed when the reaction is about to complete.</p> <p>(ii) $2KClO_3(s) \rightarrow 2KCl(s) + 3O_2(g)$ \therefore 3 mol of oxygen requires 2 mol of $KClO_3$.</p> <p>For 2.4 mol of oxygen, we need = 1.6 mol of $KClO_3$</p> <p>Therefore, mass of $KClO_3$ required = $1.6 \text{ mol} \times 122.5 \text{ g mol}^{-1} = 196.0 \text{ g}$</p>																
Q25.	<p>The first (IE_1) and second (IE_2) ionisation energies (kJ/mol) of a new element designated by Roman numerals are shown below:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>IE_1</th> <th>IE_2</th> </tr> </thead> <tbody> <tr> <td>I</td> <td>2372</td> <td>5251</td> </tr> <tr> <td>II</td> <td>520</td> <td>7300</td> </tr> <tr> <td>III</td> <td>900</td> <td>1760</td> </tr> <tr> <td>IV</td> <td>1680</td> <td>3380</td> </tr> </tbody> </table> <p>Which of these elements is likely to be</p> <p>(i) a reactive metal (ii) a reactive non-metal (iii) a noble gas, and</p> <p>Ans: (i) a reactive metal - II (ii) a reactive non-metal - IV (iii) a noble gas - I</p>		IE_1	IE_2	I	2372	5251	II	520	7300	III	900	1760	IV	1680	3380	(3)
	IE_1	IE_2															
I	2372	5251															
II	520	7300															
III	900	1760															
IV	1680	3380															
Q26.	<p>Balance the given redox reaction in acidic medium. (<i>Steps of balancing to be shown</i>).</p> $Cr_2O_7^{2-} + H^+ + I^- \longrightarrow Cr^{3+} + I_2 + H_2O$ <p>Ans:</p> $Cr_2O_7^{2-} + 6I^- + 14H^+ \rightleftharpoons 2Cr^{3+} + 3I_2 + 7H_2O$	(3)															
Q27.	<p>(i) Write de Broglie equation.</p> <p>(ii) The uncertainty in the position of a moving bullet of mass 10 g is 10^{-5} m. Calculate The uncertainty in its velocity. (Given : $h = 6.626 \times 10^{-34}$ Js).</p> <p>Ans:</p> <p>(i) de Broglie equation: $\lambda = h/mv$ (symbols have usual significances).</p> <p>(ii)</p>	(3)															

	<p>Answer: According to Heisenberg Uncertainty principle :</p> $\Delta x \cdot \Delta p \geq h/4\pi$ $\Delta x \cdot m(\Delta v) \geq h/4\pi$ <p>Given: $h = 6.626 \times 10^{-34}$ Js , $\Delta x = 10^{-5}$ m , $m = 10$ g = 10^{-2} kg .</p> $\Delta v = h / 4\pi m(\Delta x)$ $\Delta v = (6.626 \times 10^{-34}) / (4 \times 3.14 \times 10^{-2} \times 10^{-5}) = 5.27 \times 10^{-28} \text{ ms}^{-1} \text{ (Ans)}$	
Q28.	<p>Which is most stable out of O_2^+, O_2^- & O_2^{2-}? Explain. Arrange them in increasing order of bond length & bond dissociation energy.</p> <p>Ans. Molecular orbital electronic configurations are</p> $O_2^+ = (15 \text{ e}^-) \sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 \sigma 2p_z^2 (\pi 2p_x^2 = \pi 2p_y^2) (\pi^* 2p_x^1 = \pi^* 2p_y^0)$ $O_2^- = (17 \text{ e}^-) \sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 \sigma 2p_z^2 (\pi 2p_x^2 = \pi 2p_y^2) (\pi^* 2p_x^2 = \pi^* 2p_y^1)$ $O_2^{2-} = (18 \text{ e}^-) \sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 \sigma 2p_z^2 (\pi 2p_x^2 = \pi 2p_y^2) (\pi^* 2p_x^2 = \pi^* 2p_y^2)$ $\text{Bond order of } O_2^+ = \frac{N_b - N_a}{2} = \frac{10 - 5}{2} = 2.5 \quad \text{Bond order of } O_2^- = \frac{N_b - N_a}{2} = \frac{10 - 7}{2} = 1.5$ $\text{Bond order of } O_2^{2-} = \frac{N_b - N_a}{2} = \frac{10 - 8}{2} = 1$ <p>So, Bond order increases $O_2^{2-} < O_2^- < O_2^+$ Hence, O_2^+ is most stable.</p> <p>Bond length: $O_2^+ < O_2^- < O_2^{2-}$</p> <p>Bond dissociation energy: $O_2^{2-} < O_2^- < O_2^+$</p>	(3)
<p>SECTION – D</p> <p><i>The following questions are case -based questions. Each question has an internal choice and carries 4 marks each. Read the passage carefully and answer the questions that follow.</i></p>		
Q29.	<p>Read the passage given below and answer the following questions:</p> <p>Hydrocarbons are compounds of carbon and hydrogen only, obtained from coal and petroleum mainly which are major sources of energy. Hydrocarbons are classified as open chain, saturated (alkanes), unsaturated (alkenes and alkynes), cyclic (alicyclic) and aromatic based on structure. Alkanes show conformational isomerism due to free rotation along C-C bond leading to staggered and eclipsed conformations of ethane. The angle of rotation about C-C bond is called the dihedral angle or torsional angle and is maximum, i.e. 180° in staggered conformation and minimum in eclipsed conformation. Thus, torsional strain is minimum in staggered conformation and maximum in eclipsed form. The two forms differ in energy by 12.5 kJ mol^{-1}. This energy barrier is so small that small thermal or kinetic energy is sufficient to overcome it by intermolecular collisions. Alkenes show geometrical (Cis-trans) isomerism due to restricted rotation around carbon-carbon double bond.</p> <p>Answer the following questions on the basis of above data:</p> <p>(a) Which conformation of ethane is relatively more stable?</p> <p>(b) Alkanes show conformational isomerism but alkenes do not .Why?</p> <p>(c) Draw Sawhorse's projections of ethane ?</p> <p style="text-align: center;">OR</p>	(1+1+2=4)

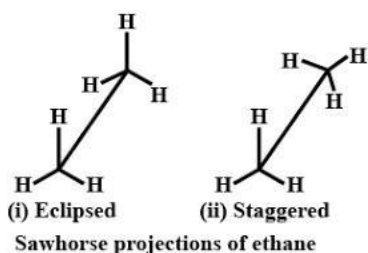
(c) Why is trans but-2-ene has higher melting point than cis but-2-ene?

Ans:

(a) The staggered conformation is most stable because the hydrogens and bonding pairs of electrons are at maximum distance, thus causing minimum repulsion

(b) In alkanes there is free rotation in Carbon-Carbon single bond but Free rotation is not possible in alkenes

(c)



OR

(c) The melting point of trans but-2-ene is generally higher than that of cis isomers because in trans isomer, bulky groups lie on the opposite side of the double bond. Therefore, the molecule is symmetrical and hence packed well in the crystal lattice.

Q30.

Read the passage given below and answer the following questions:

(1×4=4)

The capacities of shells with a given principal quantum number are fixed by

- (1) the rules governing the permitted values of the quantum numbers and
- (2) the Pauli Exclusion Principle.

The permitted values of the quantum numbers are:

Principal quantum number	n	1 to ∞
Azimuthal quantum number	l	0 to $n-1$ (n values)
Magnetic quantum number	m_l	$-l$ to $+l$, ($2l+1$ values)
Spin quantum number	m_s	$-\frac{1}{2}$ or $+\frac{1}{2}$ (2 values)

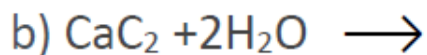
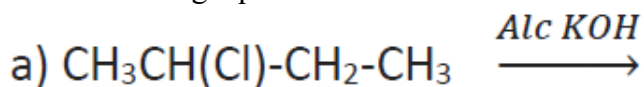
The Pauli Exclusion Principle states that no two electrons in the same atom may have the same values of all four quantum numbers. It follows that, for a given value of n , there are $2n^2$ different sets of values for the quantum numbers, because l may have the values 0, 1, . . . , $n-1$, and for each value of l there are $2l+1$ values of m_l and for each set of values of l and m there are just two choices for m_s .

(Reference : Thomas H. Hazlehurst, *J. Chem. Educ.* 1941, 18, 12, 580 Publication Date: December 1, 1941, *Journal of American Chemical Society*).

Answer the following questions on the basis of above data:

	<p>(i) Azimuthal quantum number defines: (A) e/m ratio of electron (B) spin of electron (C) angular momentum of electron (D) magnetic momentum of electron</p> <p>(ii) What is the maximum number of electrons having $n = 3$ and $l = 2$?</p> <p>(iii) (a) Write the correct set of quantum numbers (value of n and l) for the unpaired electron of chlorine atom. (b) The total number of orbitals in a shell having principal quantum number n is (1) $2n$ (2) n^2 (3) $2n^2$ (4) $n+1$</p> <p style="text-align: center;">OR</p> <p>(iii) (b) Match the following:</p> <table style="width: 100%; border: none;"> <thead> <tr> <th style="text-align: center;">List-I</th> <th style="text-align: center;">List-II</th> <th style="text-align: center;">List-III</th> </tr> </thead> <tbody> <tr> <td>a. $2s$</td> <td>p. Dough not shape</td> <td>i. along z-axis</td> </tr> <tr> <td>b. $2p_x$</td> <td>q. Spherical</td> <td>ii. In between x & y-axis</td> </tr> <tr> <td>c. $3d_{xy}$</td> <td>r. Dumb bell</td> <td>iii. non-directional</td> </tr> <tr> <td>d. $3d_{z^2}$</td> <td>s. Double dumb bell</td> <td>iv. along x-axis</td> </tr> </tbody> </table> <p>Ans: (i) (C) Angular momentum of electrons (ii) 10 (iii) a. $n=3$ & $l=1$ b. (2) n^2</p> <p style="text-align: center;">OR</p> <p>(a) (q) (iii), b. (r). (iv), c. (s). (ii), d. (p).(i)</p>	List-I	List-II	List-III	a. $2s$	p. Dough not shape	i. along z-axis	b. $2p_x$	q. Spherical	ii. In between x & y-axis	c. $3d_{xy}$	r. Dumb bell	iii. non-directional	d. $3d_{z^2}$	s. Double dumb bell	iv. along x-axis	
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	<p>SECTION E</p> <p><i>The following questions are long answer type and carry 5 marks each. All questions have an internal choice.</i></p>																
<p>Q31.</p>	<p><i>Attempt either option A or B.</i></p> <p>A. (i) Give reason for following (a) Ethyne is more acidic than ethane. (b) Nitration of Toluene give ortho and para nitro toluene but not m-Nitro toluene.</p>	<p>(1×5=5)</p>															

(ii) Complete the following equations:



(iii) Give a chemical test to distinguish the following pairs: Ethene and Ethyne

OR

B. (i) Write chemical equation for lab preparation of ethene.

(ii) What happens:

(a) when ethene is passed through Br₂ water. (*Give chemical equation*)

(b) Ethene is oxidized in presence of Alk KMnO₄. (*Give chemical equation*)

(iii) Convert the following:

(a) Ethyne to Propyne

(b) Benzene to Acetophenone

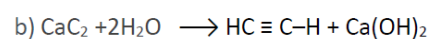
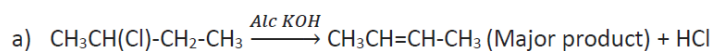
Ans:

A.

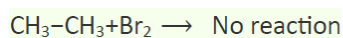
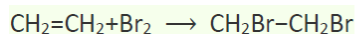
a) In ethyne, the hybridization of each carbon is sp which has 50 % s-character and is more electronegative. Therefore, the acidity order should be, ethyne > ethene.

b) In Toluene, -CH₃ group attached to benzene ring causes +R effect and activates the benzene ring, i.e. increases the electron density at ortho and para position.

(ii)



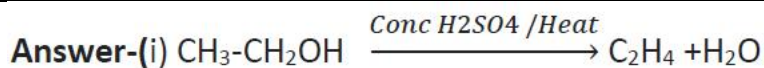
(ii). Ethene is an unsaturated compound and ethane is a saturated compound. Ethene will react with bromine water and will decolourise bromine water but ethane will not. The reaction is :



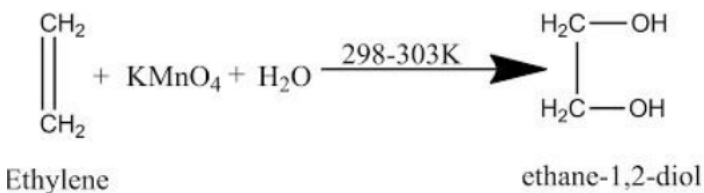
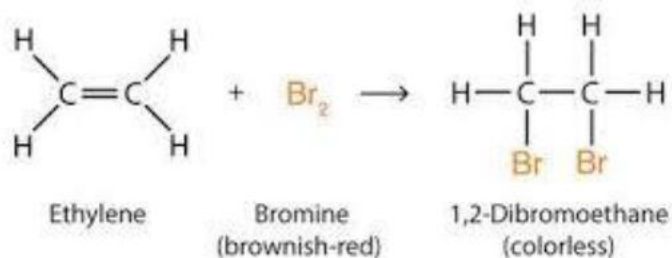
OR

B.

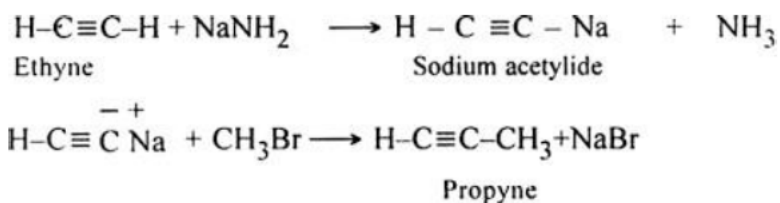
(1+1+3=5)



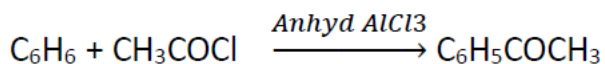
a) Ethene reacts with bromine to form colorless 1,2-dibromoethane.



(ii) (a) Ethyne to Propyne



(b) Benzene to Acetophenone



Q32.

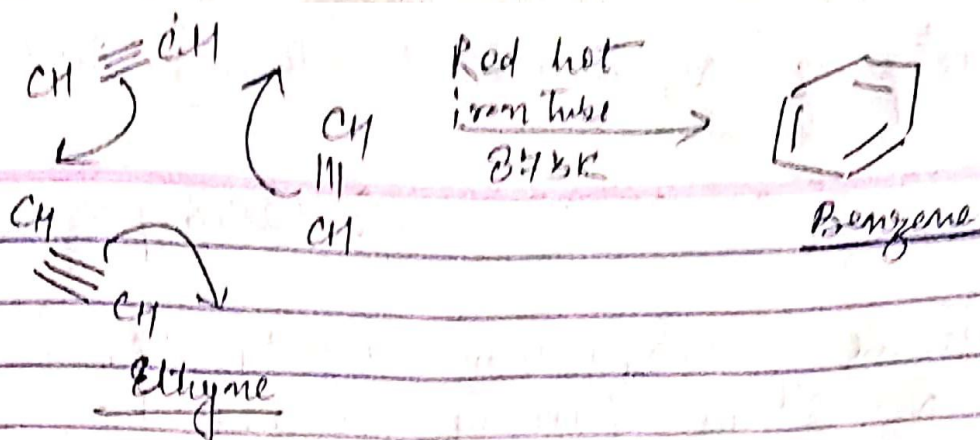
Attempt either option A or B.

A. Attempt *any five* of the following:

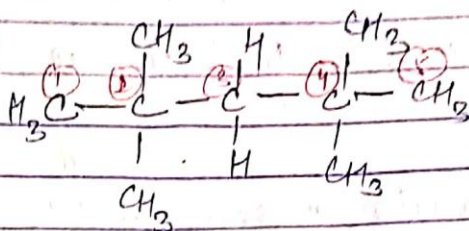
(a) Arrange the following: [*Increasing order of stability*]

(1×5=5)

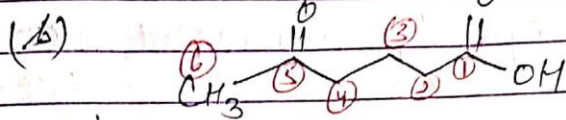
(i) Ethyne to Benzene
By cyclic polymerisation:-



(ii) (a) $(\text{CH}_3)_3\text{C}-\text{CH}_2-\text{C}(\text{CH}_3)_3$

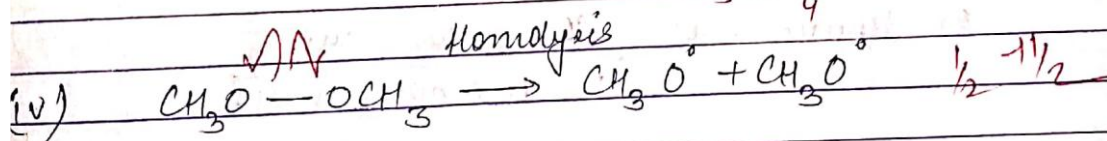
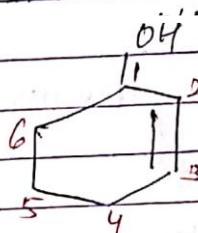


2, 2, 4, 4 tetramethyl pentane

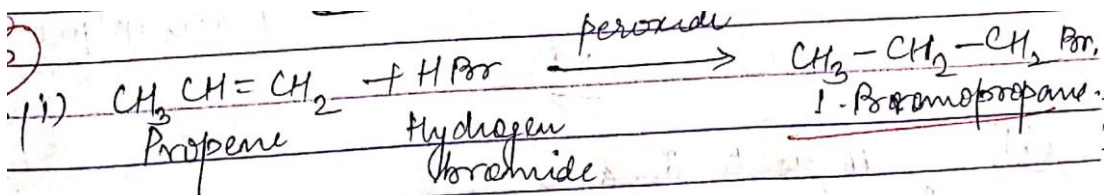


5-oxohexanoic acid

(ii) Cyclohex-2-en-1-ol

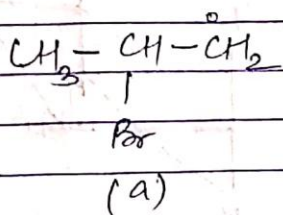
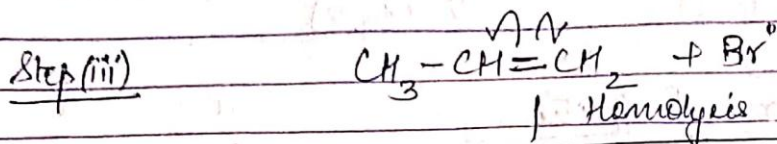
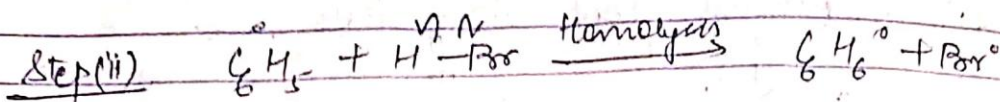
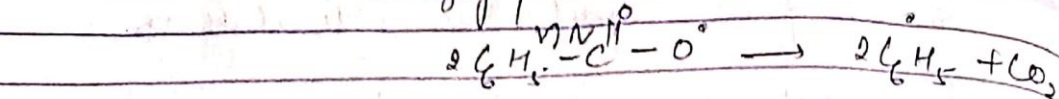
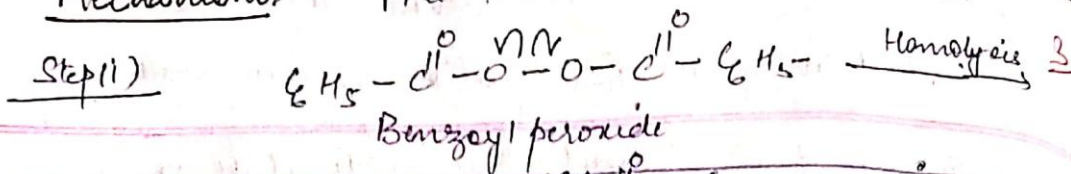


OR

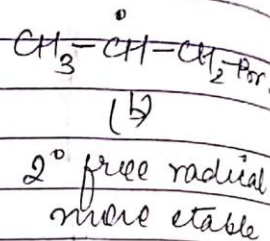


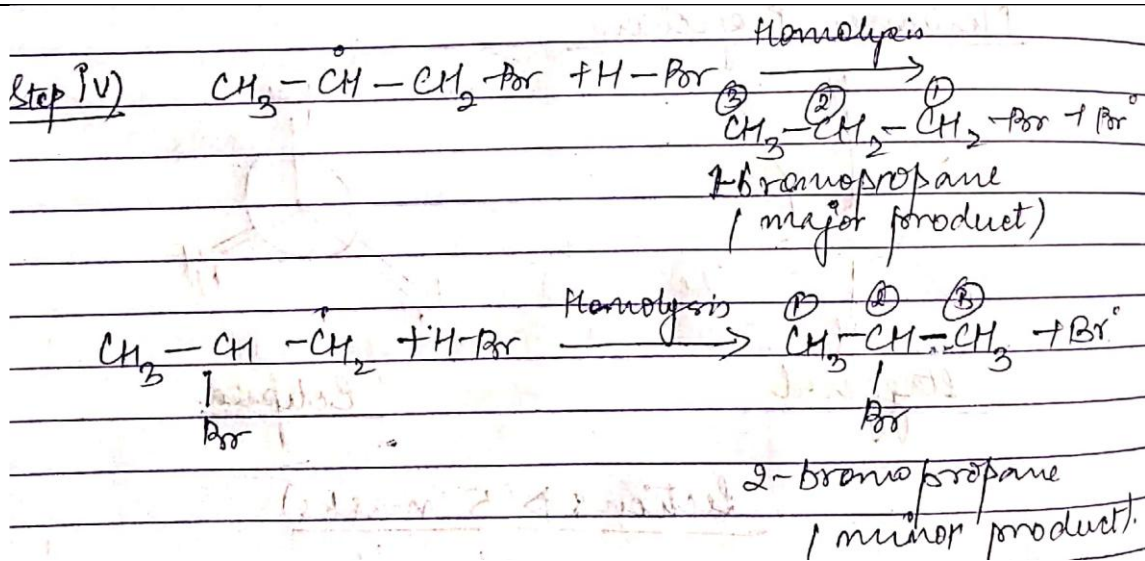
(ii) Intermediate \rightarrow Free radical

Mechanism - Free radical chain mechanism



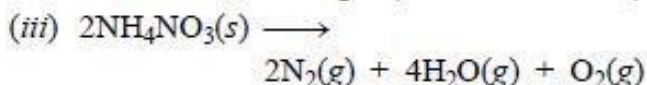
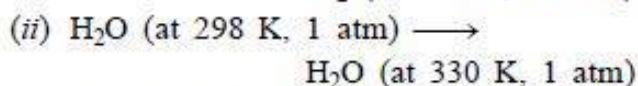
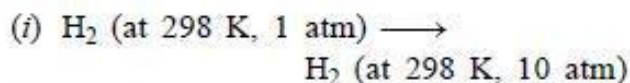
1° free radical
less stable



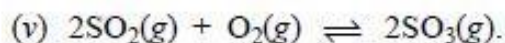


Q33. Attempt either option A or B.

A. What is meant by entropy? Predict the sign of entropy change in each of the following:



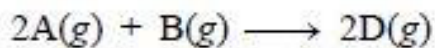
(iv) Crystallization of copper sulphate from its saturated solution



OR

B. (i) State Hess's law.

(ii) For the reaction:



$$\Delta U^\circ = -10.5 \text{ kJ and}$$

$$\Delta S^\circ = -44.1 \text{ J K}^{-1} \text{ mol}^{-1}$$

Calculate ΔG° for the reaction and predict whether the reaction may occur spontaneously.

(1×5=5)

(1×5=5)

Ans : Entropy is defined as the degree of randomness or disorder

- (i) $\Delta S = -ve$ (ii) $\Delta S = +ve$
(iii) $\Delta S = +ve$ (iv) $\Delta S = -ve$
(v) $\Delta S = -ve$

OR

Hess's Law: The total amount of heat evolved or absorbed in a reaction is the same whether the reaction takes place in one step or in number of steps. In other words, the total amount of heat change in a reaction depends only upon the reactants and the products and is independent of the path taken.

$$\Delta H^\circ = \Delta U^\circ + \Delta n_g RT$$

$$\Delta H^\circ = (-10500 - 2477.57) \text{ J mol}^{-1}$$
$$= -12977.575 \text{ J mol}^{-1}$$

$$\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$$
$$= -12977.58 - 298\text{K} \times (-44.1) \text{ JK}^{-1} \text{ mol}^{-1}$$
$$= -12977.58 + 13141.80$$

$$\Delta G^\circ = 0.164 \text{ kJ mol}^{-1}$$

\Rightarrow Since ΔG° is positive, the process is non-spontaneous.